HEAT DISSIPATING FAN WITH AN AIRFLOW GUIDING STRUCTURE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a heat dissipating fan with an airflow guiding structure.

2. Description of Related Art

A typical conventional heat dissipating fan is disclosed in, e.g., USPN 5,522,700, USPN 5,584,339 and USPN 5,582,506 and includes a cover plate, an impeller, and a heat dissipating plate. The cover plate includes an air inlet and a base, and the impeller is mounted to an upper side or an underside of the cover pate. The heat dissipating plate is mounted to an object to be dissipated, such as a central processing unit. In operation, the impeller forces the air from the inlet to move toward the heat dissipating plate for dissipating heat.

The airflow can, however, only move outward along the extending direction of the fins on the heat dissipating plate, and the heat dissipation effect can only be achieved through the heat dissipating plate. The heat dissipating fan could neither guide and expel the airflow directly downward nor directly provide a heat dissipating effect for an object located right below the heat dissipating fan. Further, a fan unit consisting of a cover plate and an impeller must be used with a heat dissipating plate. Application of the fan unit consisting of a cover plate and an impeller is limited, and it is difficult to

reduce the cost for manufacturing various types of heat dissipating fans. Further, the air inlet amount could not be effectively increased, as the impeller can only drive air in via the air inlet of the cover plate. Further, the wind pressure could not be increased. As a result, the application of the heat dissipating fan is limited, and the heat dissipating efficiency is poor.

Another typical conventional heat dissipating fan disclosed in, e.g., Taiwan Utility Model Publication No. 540641, is an axial fan including a casing and an impeller. The impeller is rotatably mounted on a base provided on an air outlet side of the casing. On an air inlet side of the casing, a plurality of radial inlets extend from an air inlet toward a periphery of the casing. An air gain guiding plate extends radially outward from the respective blade on the impeller and aligns with the respective radial inlet, thereby increasing the air inlet amount.

However, the impeller must be mounted on the base of the casing such that the casing of a certain specification can only be used with an impeller of a corresponding specification, resulting in a limited application of the casing and the impeller and thus failing to effectively reduce the cost for manufacturing various types of heat dissipating fans.

Further, since the respective air gain guiding plates can only drive the air to pass through the respective radial inlets and since the air is driven inward and downward by the respective air gain guiding plates, turbulence is generated in a joint area between the periphery of the respective radial inlet

and an inner periphery of the casing. As a result, provision of the air gain guiding plates results in wind noise. Further, the axial flow fan could not increase the wind pressure. Application of the axial flow fan is limited and the heat dissipating fan is unsatisfactory.

OBJECTS OF THE INVENTION

An object of the present invention is to provide a heat dissipating fan with an airflow guiding structure for guiding airflow and for improving the overall heat dissipating efficiency.

Another object of the present invention is to provide a heat dissipating fan with an airflow guiding structure to increase an overall area for the incoming air, thereby increasing the air inlet amount and thus improving the overall heat dissipating efficiency.

A further object of the present invention is to provide a heat dissipating fan with an airflow guiding structure to increase the wind pressure and thus improve the overall heat dissipating efficiency.

SUMMARY OF THE INVENTION

In accordance with an aspect of the invention, a heat dissipating fan includes a cover plate having an air inlet and a base, an impeller mounted to the base and having a plurality of blades, and an air guiding member having an air passageway and an air outlet. A portion of an axial height of the respective blade is received in the air passageway of the air guiding member. Side inlets are defined between the cover plate and the air guiding member.

Air intake occurs simultaneously in the air inlet and in the side inlets when the impeller turns, driving airflow to exit the air outlet in a predetermined direction.

Other objects, advantages and novel features of this invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an exploded perspective view of a first embodiment of a heat dissipating fan in accordance with the present invention;

Fig. 2 is a perspective view of the heat dissipating fan in Fig. 1;

Fig. 3 is a sectional view taken along plane 3-3 in Fig. 2;

Fig. 4 is an exploded perspective view of a second embodiment of the heat dissipating fan in accordance with the present invention;

Fig. 5 is a perspective view of the heat dissipating fan in Fig. 4;

Fig. 6 is a sectional view taken along plane 6-6 in Fig. 5;

Fig. 7 is an exploded perspective view of a third embodiment of the heat dissipating fan in accordance with the present invention;

Fig. 8 is a sectional view of the heat dissipating fan in Fig. 7;

Fig. 9 is an exploded perspective view of a fourth embodiment of the heat dissipating fan in accordance with the present invention;

Fig. 10 is a sectional view of the heat dissipating fan in Fig. 9;

Fig. 11 is an exploded perspective view of a fifth embodiment of the

heat dissipating fan in accordance with the present invention;

Fig. 12 is a sectional view of the heat dissipating fan in Fig. 11.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Figs. 1 through 3, a first embodiment of a heat dissipating fan in accordance with the present invention comprises a cover plate 10, an impeller 20, and an air guiding member 30. The cover plate 10 is made of plastics or metal and includes an air inlet 11 and a base 12 extending in a plane parallel to another plane in which the air inlet 11 lies. A plurality of ribs 13 project from a periphery delimiting the air inlet 11 and connect the base 12, thereby supporting the base 12. The cover plate 10 further includes a first engaging portion 14. In this embodiment, the first engaging portion 14 includes a plurality of through-holes 14.

The impeller 20 is rotatably mounted to an upper side of the base 12 that faces the cover plate 10. The impeller 20 and the cover plate 10 together form a fan unit 1. The impeller 20 includes a plurality of blades 21 on an outer periphery thereof for driving air. The air guiding member 30 is made of plastics or metal and includes a second engaging portion 31, an air passageway 32, an air outlet 33, and a plurality of side inlets 34. In this embodiment, the second engaging portion 31 includes a plurality of posts each having a screw hole 310 aligned with the respective through-hole 14 of the cover plate 10. A fastener 40 is extended through the respective through-hole 14 of the cover plate 10 and the respective screw hole 310, thereby fixing

the cover plate 10 to the air guiding member 30. As illustrated in Fig. 3, a portion of the axial height of the respective blade 21 of the impeller 20 is received in the air passageway 32, with a space being defined between the cover plate 10 and the air guiding member 30, forming the side inlets 34 in the fan unit 1. The air passageway 32 guides the airflow toward the air outlet 33. The air outlet 33 is oriented in a predetermined direction, e.g., directly below the air guiding member 30.

As illustrated in Fig. 3, when the impeller 20 turns, air intake occurs simultaneously in the air inlet 11 and in the side inlets 34 through operation of the blades 21 of the impeller 20. The airflow exits the heat dissipating fan from a position directly below the air guiding member 30, dissipating heat of an object (e.g., a power supply or a casing of a personal computer, not shown) or proceeding with air current exchange. Since additional air is inputted by the impeller 20 via the side inlets 34, the air inlet amount is increased. Further, the air passageway 32 of the air guiding member 30 guides the outgoing air in a predetermined direction; namely, the airflow direction can be guided. Thus, the heat dissipating efficiency for a to-be-dissipated object located in a predetermined position is improved. Further, the first and second engaging portions 14 and 31 can be varied according to need. For example, the first and second engaging portions 14 and 31 can be engaged together by means of snapping, welding, bonding, etc.

Figs. 4 through 6 illustrate a second embodiment of the heat

dissipating fan in accordance with the present invention. In this embodiment, the heat dissipating fan comprises a cover plate 10, an impeller 20, and an air guiding member 30. A plurality of ribs 13 project radially inward from a periphery delimiting an air inlet 11 of the cover plate and connect a base 20 concentrically located in the air inlet 11. Further, the impeller 20 is rotatably mounted to an underside of the base 12. Thus, the impeller 20 and the cover plate 10 together form a suspensory fan unit 1. Further, the first engaging portion 14 of the cover plate 10 includes a plurality of posts having a screw hole 141, and the second engaging portion 31 of the air guiding member 30 includes a plurality of through-holes 31 respectively aligned with the screw holes 141. A fastener 40 is extended through the respective through-hole 31 and the respective screw hole 141. A portion of the axial height of the respective blade 21 of the impeller 20 is received in the air passageway 32, with a space being defined between the cover plate 10 and the air guiding member 30, forming the side inlets 34 in the fan unit 1. The air passageway 32 guides the airflow toward the air outlet 33.

As illustrated in Fig. 6, when the impeller 20 turns, air intake occurs simultaneously in the air inlet 11 and in the side inlets 34 through operation of the blades 21 of the impeller 20. The air passageway 32 of the air guiding member 30 guides the airflow toward a predetermined direction. The air inlet amount is increased, and the airflow direction can be guided. Thus, the heat dissipating efficiency for a to-be-dissipated object located in a predetermined

position is improved.

Figs. 7 and 8 illustrate a third embodiment that is modified from the first embodiment. In this embodiment, the air passageway 32 of the air guiding member 30 tapers outward such that a sectional area of an air outlet side of the air passageway 32 is smaller than that of an air inlet side of the air passageway 32. Thus, the airflow is concentrated and the wind pressure of the airflow is thus increased when the airflow passes through the air passageway 32 and exits via the air outlet 34. Further, the fan unit 1 in the first embodiment or the second embodiment can be used with the air guiding member 30 of the third embodiment. Application of the heat dissipating fan is wider and the assembling tolerance is improved.

Figs. 9 and 10 illustrate a fourth embodiment that is modified from the second embodiment. In this embodiment, the air passageway 32 of the air guiding member 30 extends in a direction at an angle with an airflow direction along which the air flows. When the impeller 20 turns, air intake occurs simultaneously in the air inlet 11 and in the side inlets 34 through operation of the blades 21 of the impeller 20. The airflow can be guided to an object not directly located below the heat dissipating fan, as the air passageway 32 of the air guiding member 30 may guide the outgoing airflow leftward (see Fig. 10). Further, the fan unit 1 in the first embodiment or the second embodiment can be used with the air guiding member 30 of the fourth embodiment. Application of the heat dissipating fan is wider and the assembling tolerance

is improved.

Figs. 11 and 12 illustrate a fifth embodiment modified from the third embodiment. In this embodiment, the cover plate 10 includes a plurality of first posts 15 projecting downward from a peripheral portion of the underside of the cover plate 10, and the air guiding member 30 includes a plurality of second posts 35 projecting upward from a peripheral portion of the upper side of the air guiding member 30. When the cover plate 10 and the air guiding member 30 are assembled, the first and second posts 15 and 35 are located in the respective side inlets 34, preventing the impeller 20 from being impinged, reducing the possibility of entrance of alien objects, and improving the structural strength of the impeller 20. Further, the ribs 13 of the cover plate 10 form a plurality of stationary blades 131 for guiding airflow. The respective stationary blade 131 may include an inclining angle opposite to that of the blades 21. This allows smooth guiding of the airflow and increases the wind pressure.

The size of the side inlets 34, the shapes of the air passageway 32 of the air guiding member 30 and the blades 21 of the impeller 20, and the engaging arrangement between the first and second engaging portions 14 and 31 may vary according to the size, position, shape, and heat dissipating requirement of the object to be dissipated. Thus, the design flexibility and assembling flexibility are improved.

While the principles of this invention have been disclosed in

connection with specific embodiments, it should be understood by those skilled in the art that these descriptions are not intended to limit the scope of the invention, and that any modification and variation without departing the spirit of the invention is intended to be covered by the scope of this invention defined only by the appended claims.